



National Transportation Safety Board

Fatigue as a Safety Risk in Flight Operations: Challenges and Opportunities

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Board Member

CHC Safety & Quality Summit
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NATIONAL TRANSPORTATION SAFETY BOARD

- 1) determining the probable cause of transportation accidents**
- 2) making recommendations to prevent their recurrence**



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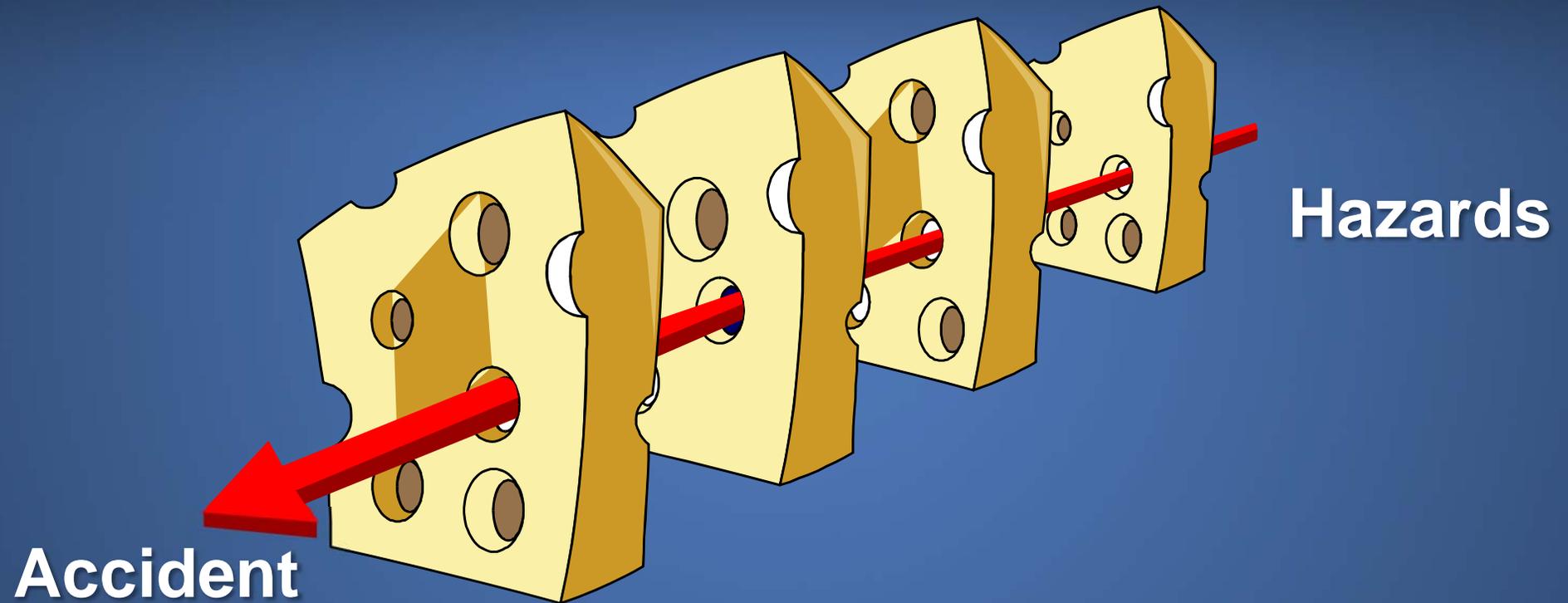
All Modes

Independent Federal Agency: Created in 1967

- >132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate



“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

Asiana 214 (July 6, 2013) San Francisco, CA (SFO)



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NTSB Go Team: 24/7/365

- Individual investigator
- Regional/limited team
- Major launch/Board Member



Key On-scene Events



Organizational Meeting

- Designate parties and party coordinators
- Establish and organize groups

Progress Meetings

- Summarize findings
- Info for briefings

Family Briefings

Press Briefings



NTSB Investigative Process



On-scene Investigation

- Organizational Meeting
- Groups and Parties
- Progress meetings
- Media Briefings
- Press Releases



Preliminary Report

Factual information



Public Hearing

- Fact finding
- Depositions
- Witnesses
- Docket



Board Meeting

- Docket
- Findings
- Conclusions
- Probable Cause
- Safety Recommendations



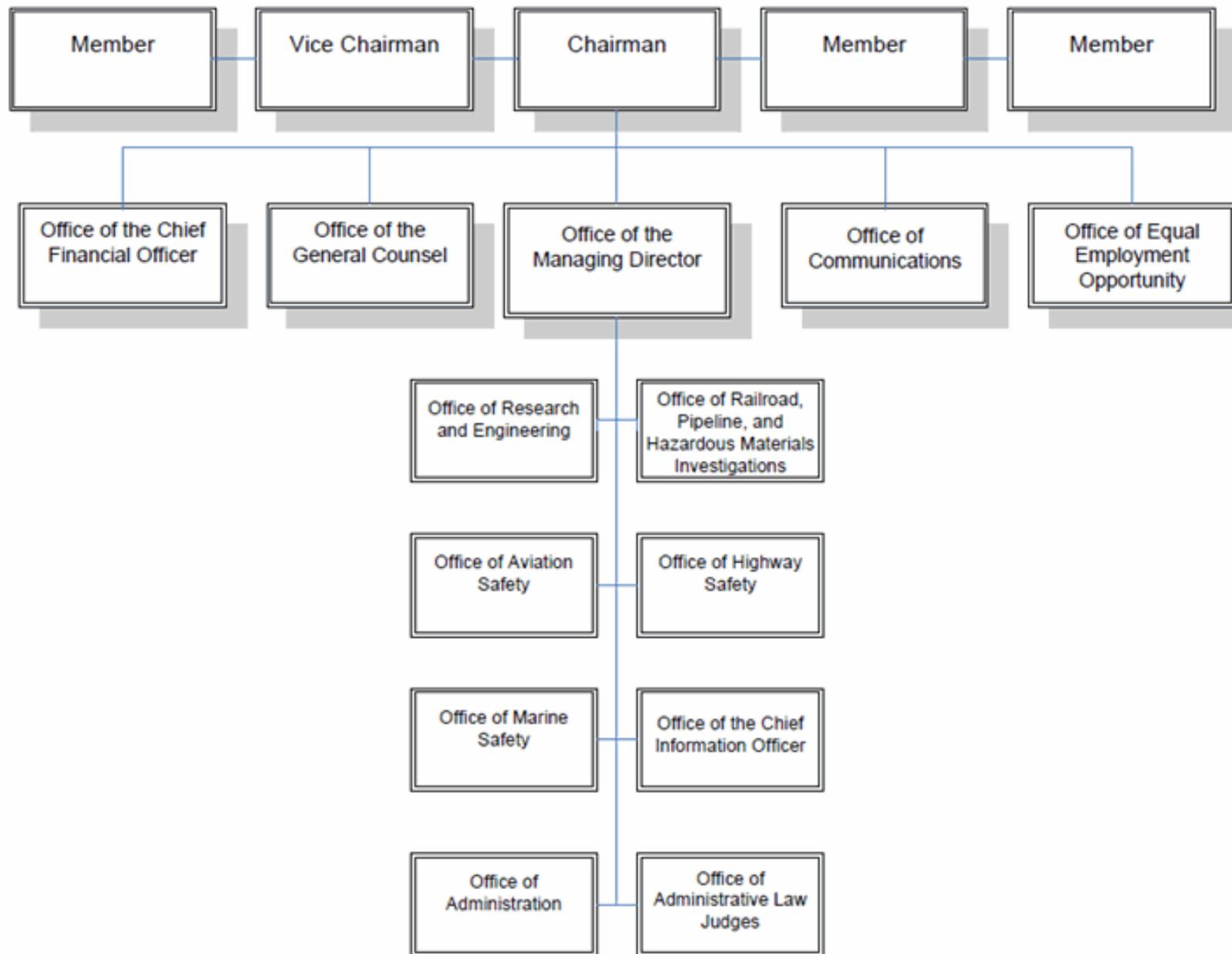
Final Report

Government in the Sunshine Act



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NATIONAL TRANSPORTATION SAFETY BOARD



NTSB: The Board

- Five Members:
 - President nominates
 - Senate confirms



Mark Rosekind
Member



Chris Hart
Vice Chairman



Debbie Hersman
Chairman



Robert Sumwalt
Member



Earl Weener
Member



NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman



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Go! Flight 1002



- early starts, multiple segment days, sleep apnea



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Honorable John K. Lauber:

No Accident \neq
Safe Operation



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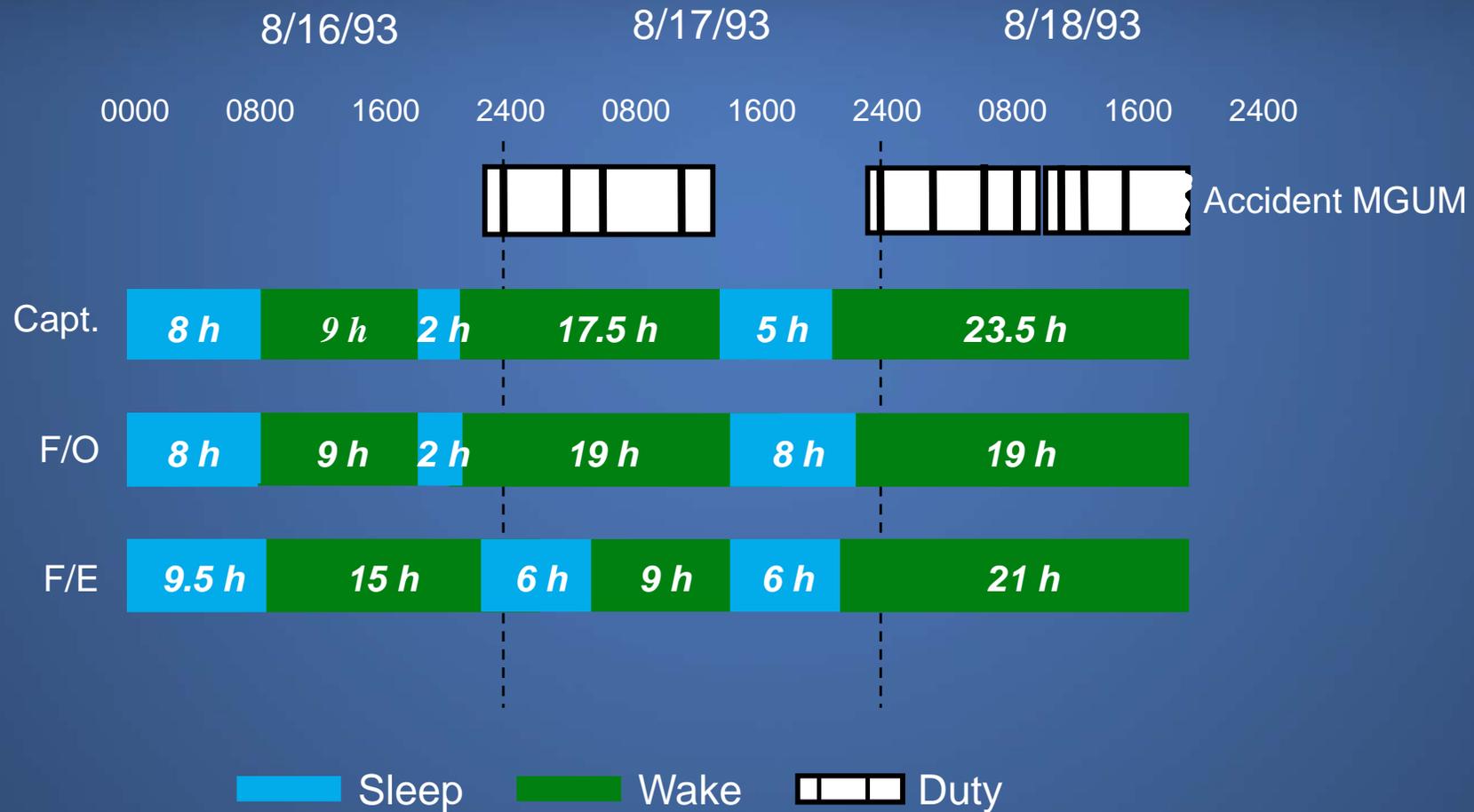
Uncontrolled In-Flight Collision with Terrain AIA Flight 808, Douglas DC-8-61, N814CK U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation
to cite fatigue as probable cause



- acute sleep loss, sleep debt, circadian disruption

Crew Sleep History



Observed Performance Effects

- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time



Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

“The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue...”



Owatonna, MN (July 31, 2008)



8 fatalities



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Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)



Probable Cause/Contributing Factors

“Contributing to the accident were . . .
(2) fatigue, which likely impaired both
pilots’ performance; . . .”

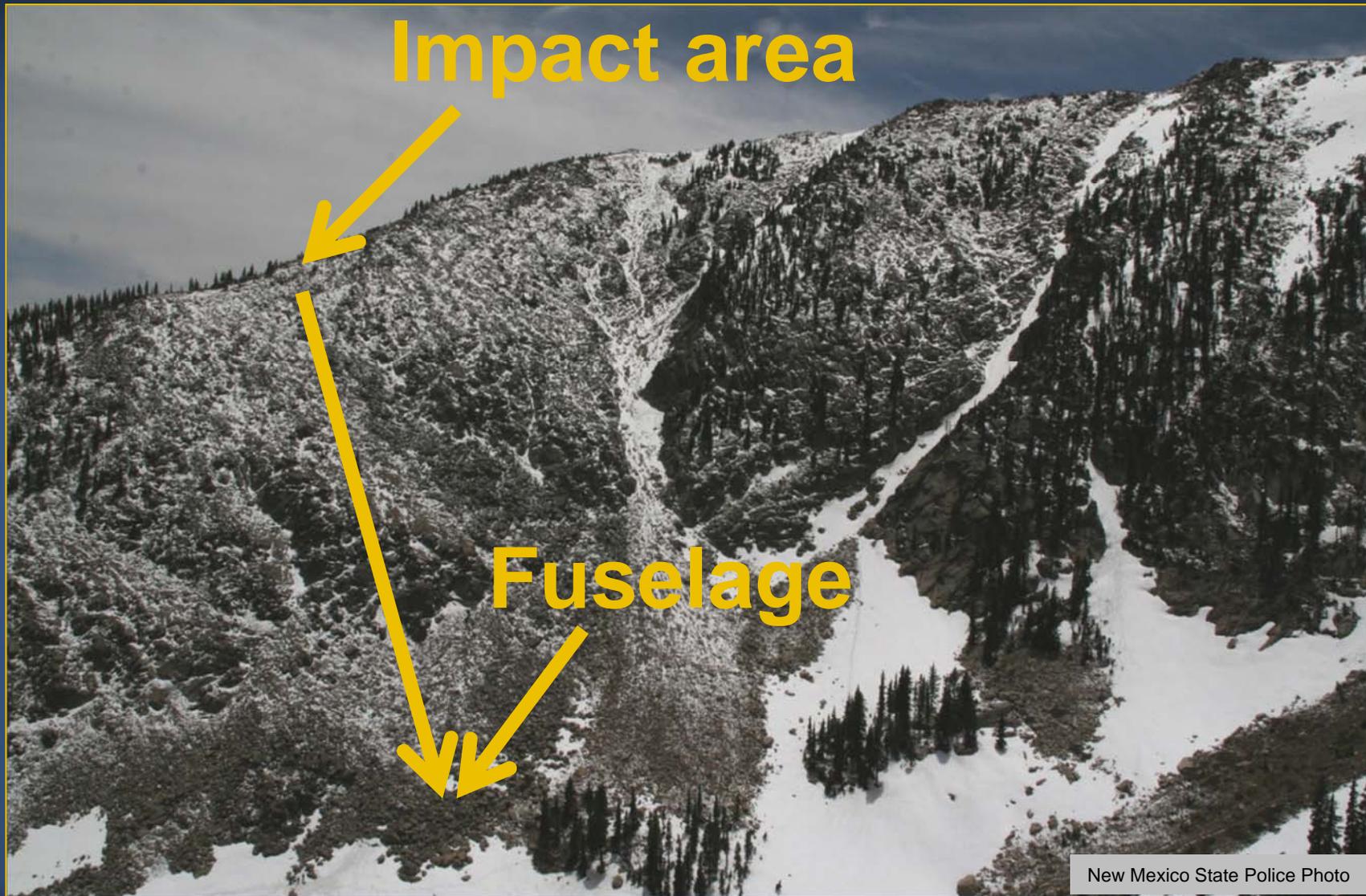


New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)

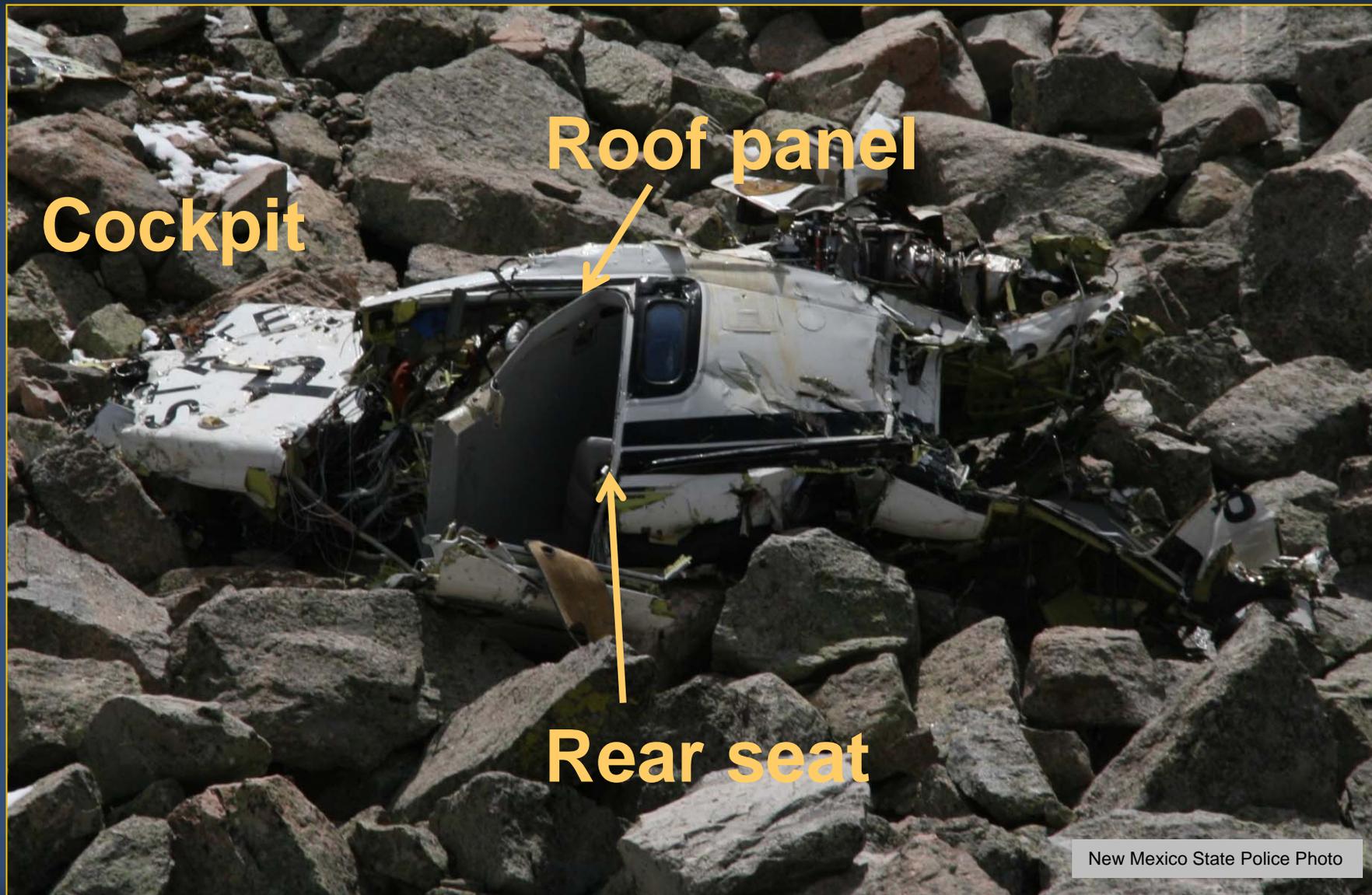


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New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)



Fuselage



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New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)

- Contributing to the accident were . . .
the pilot's fatigue . . .
- Also contributing were . . .
lack of an effective fatigue management
program for pilots . . .



Challenges of a 24/7 Society



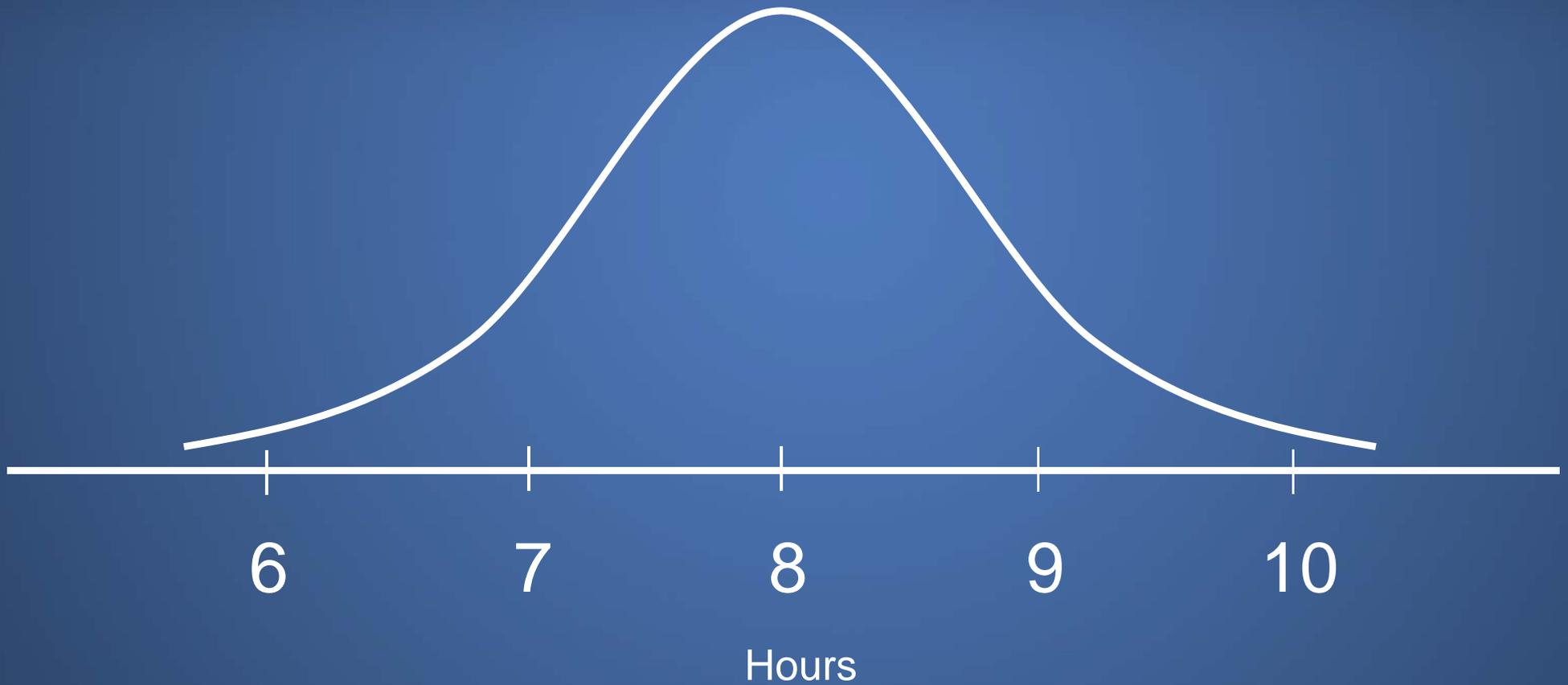
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Four Fatigue Factors +

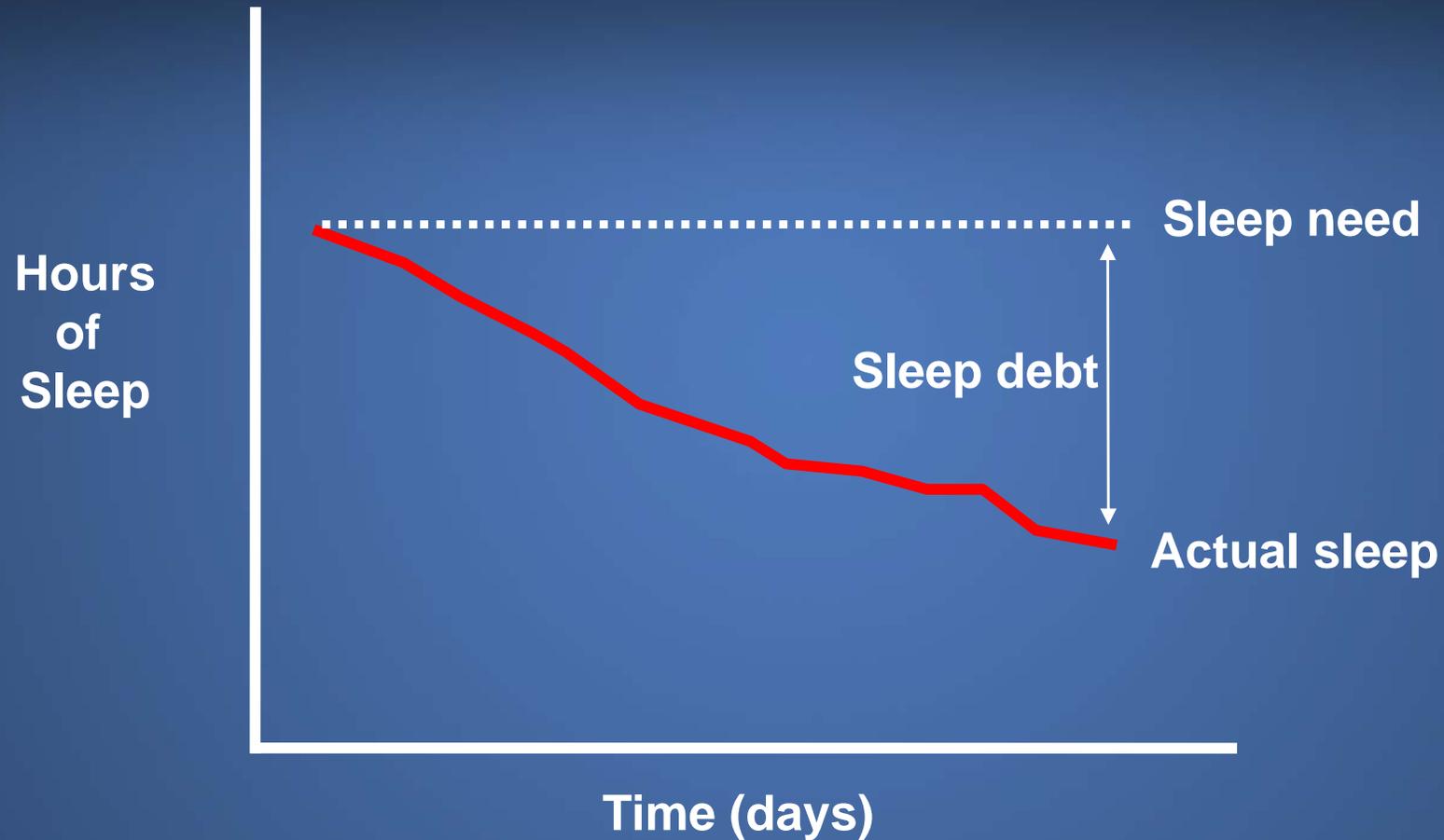
- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations



Sleep Requirement



Cumulative Sleep Debt



$\text{Sleep Need} - \text{Actual Sleep} = \text{Sleep Debt}$

Sleep debt grows cumulatively over time.

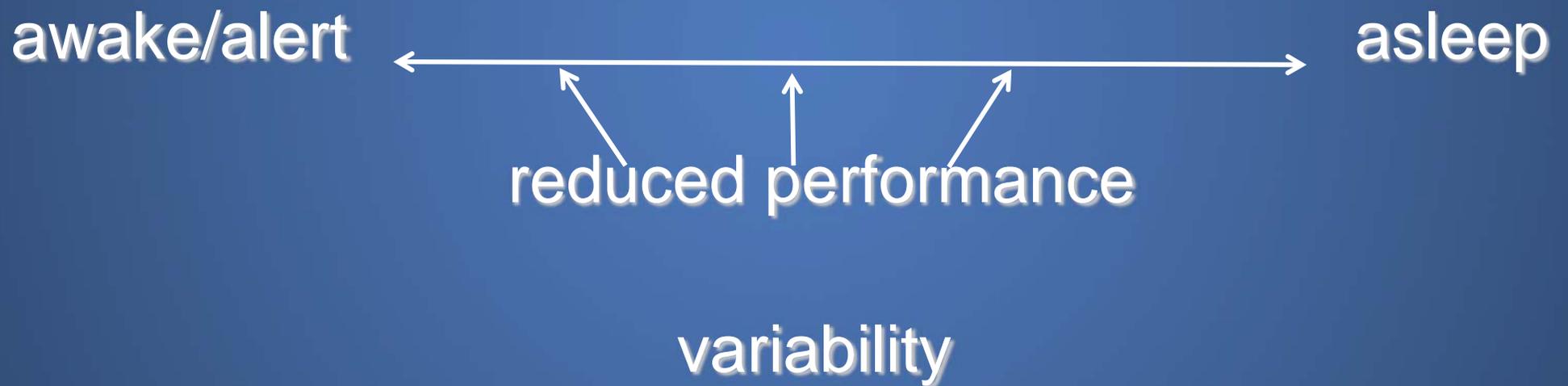


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Sleep Loss and Alcohol: Performance Equivalents

<u>Sleep loss (hrs)</u>	<u>12oz Beers</u>	<u>BrEC%</u>
2	2 - 3	.045%
4	5 - 6	.095%
6	7 - 8	.102%
8	10 - 11	.190%

Fatigue Risks

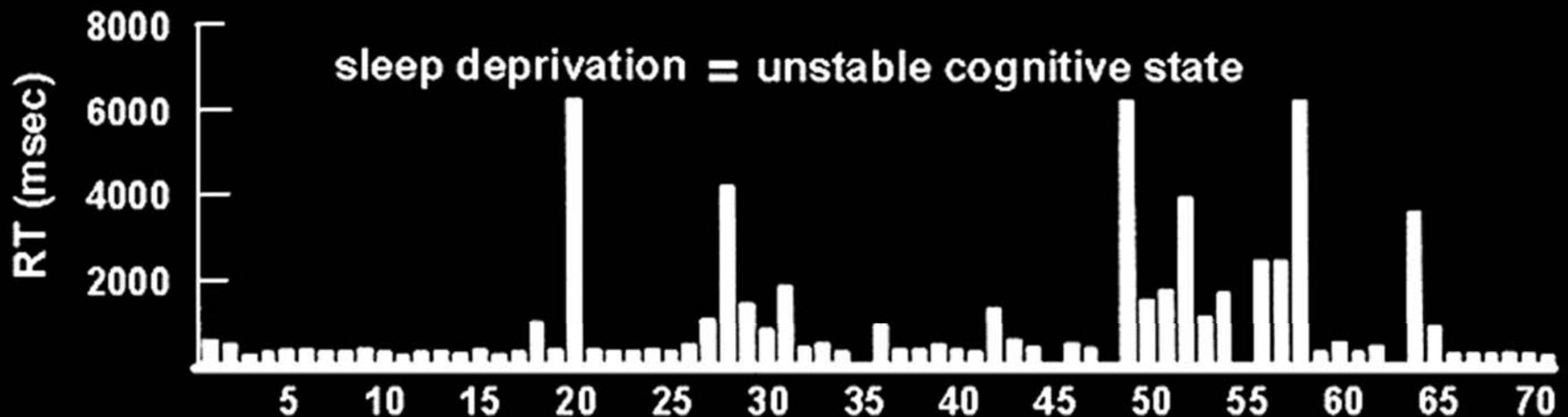
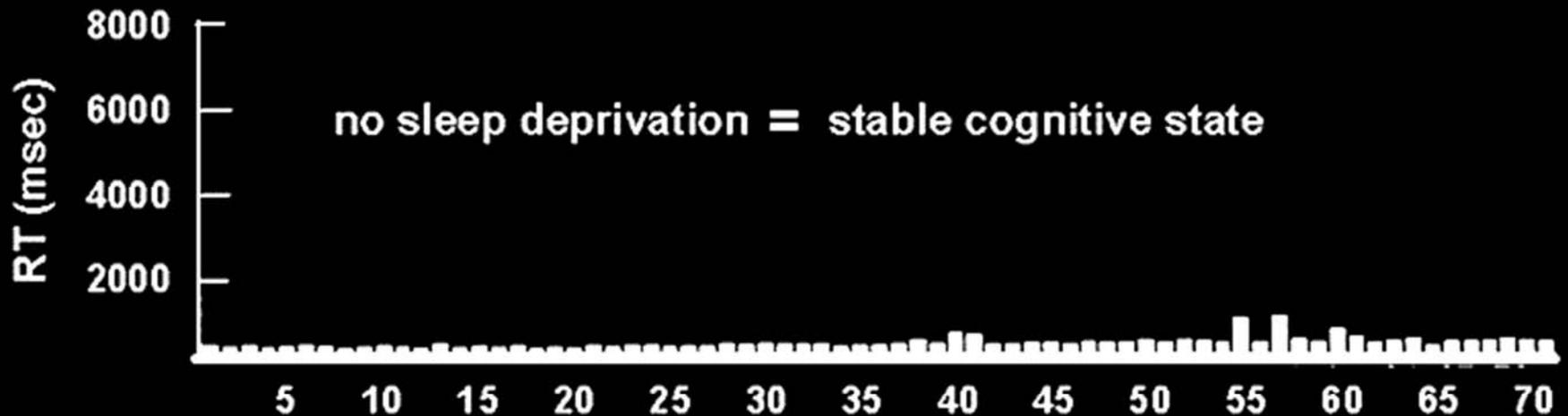


Fatigue Risks

- degraded 20 – 50%+:
 - reaction time
 - memory
 - communication
 - situational awareness
 - judgment
 - attention
 - mood
- increased:
 - irritability
 - apathy
 - attentional lapses
 - microsleeps

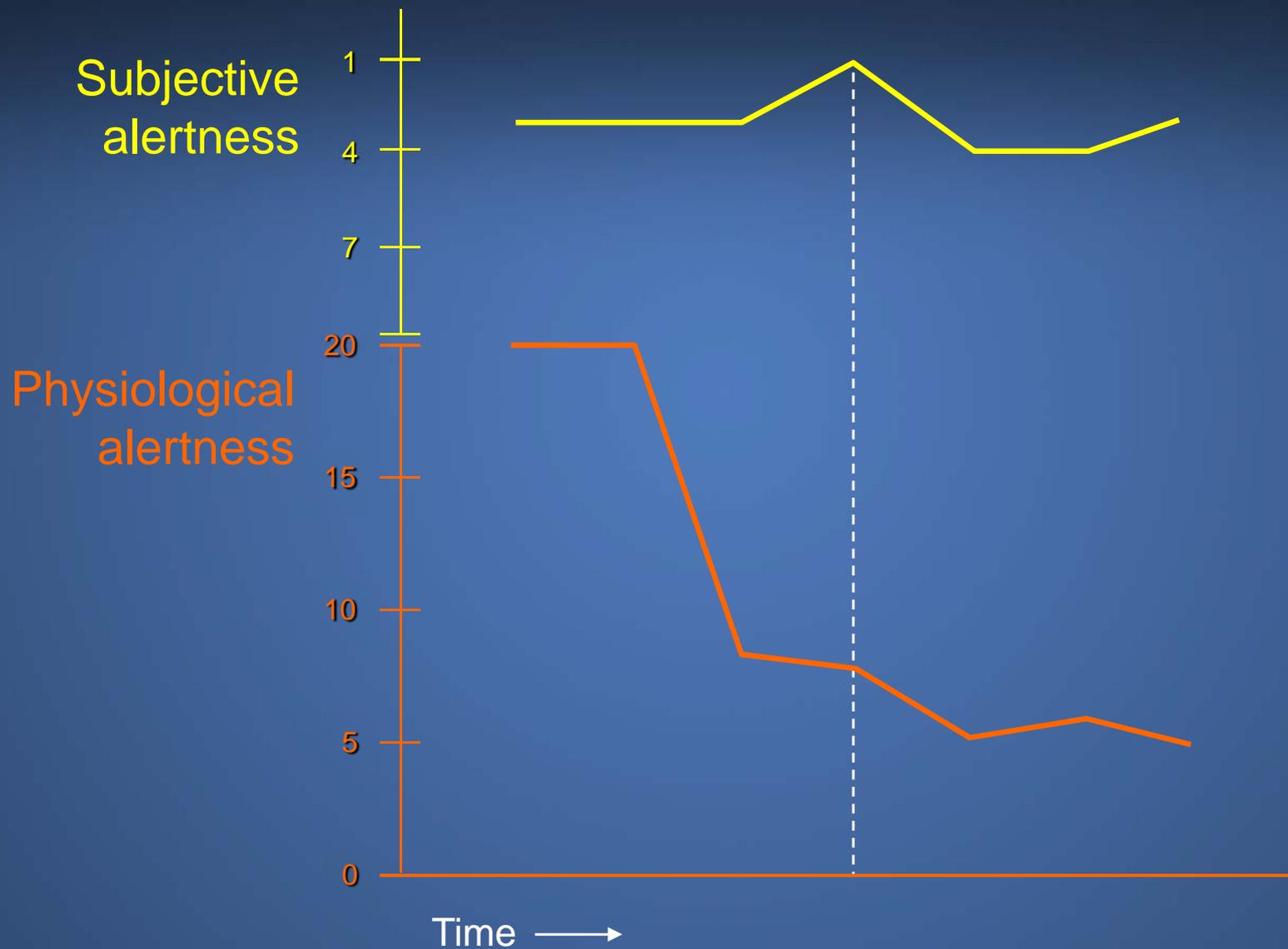


Fatigue and Reaction Times



consecutive RTs across a 10-min PVT performance task

Alertness Reports Often Inaccurate



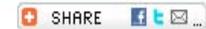
Adapted from Sasaki et al., 1986



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Home > Transportation Safety > Most Wanted List



MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human Fatigue



General Aviation Safety



Safety Management Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic Controller Professionalism



Recorders



Teen Driver Safety



Addressing Alcohol-Impaired Driving



Motorcycle Safety



NTSB Safety Recommendations: Fatigue

- MOST WANTED 1990 - 2011
- ~200 fatigue recommendations



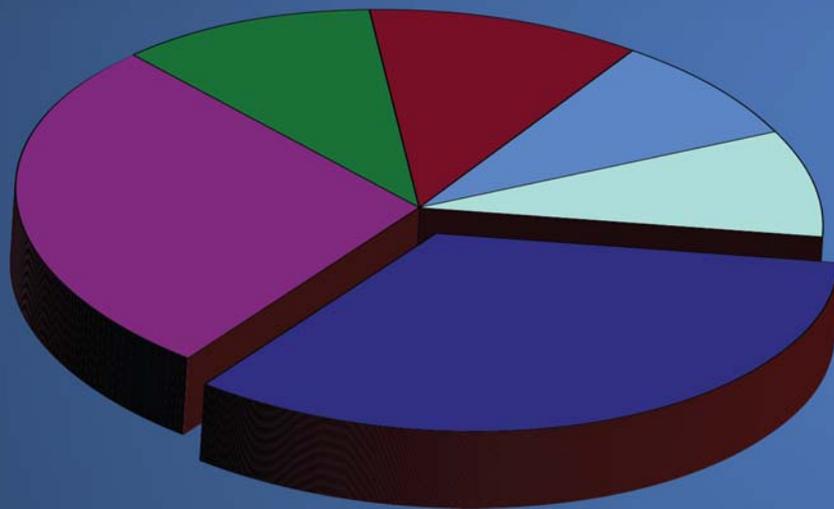
NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”



Complex Issue:

Requires Multiple Solutions



■ Scheduling Policies and Practices

■ Education/Awareness

■ Organizational Strategies

■ Healthy Sleep

■ Vehicle and Environmental Strategies

■ Research and Evaluation



NTSB Fatigue Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials



Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- Day sleep, night drive, ~ 4 am WOCL



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NTSB Fatigue Recommendations: Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability



Sleep Apnea

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities, OSA (-CPAP)



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NTSB Fatigue Recommendations: Sleep Apnea/Health Related

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Ensure drivers with apnea are effectively treated before granting unrestricted medical certification

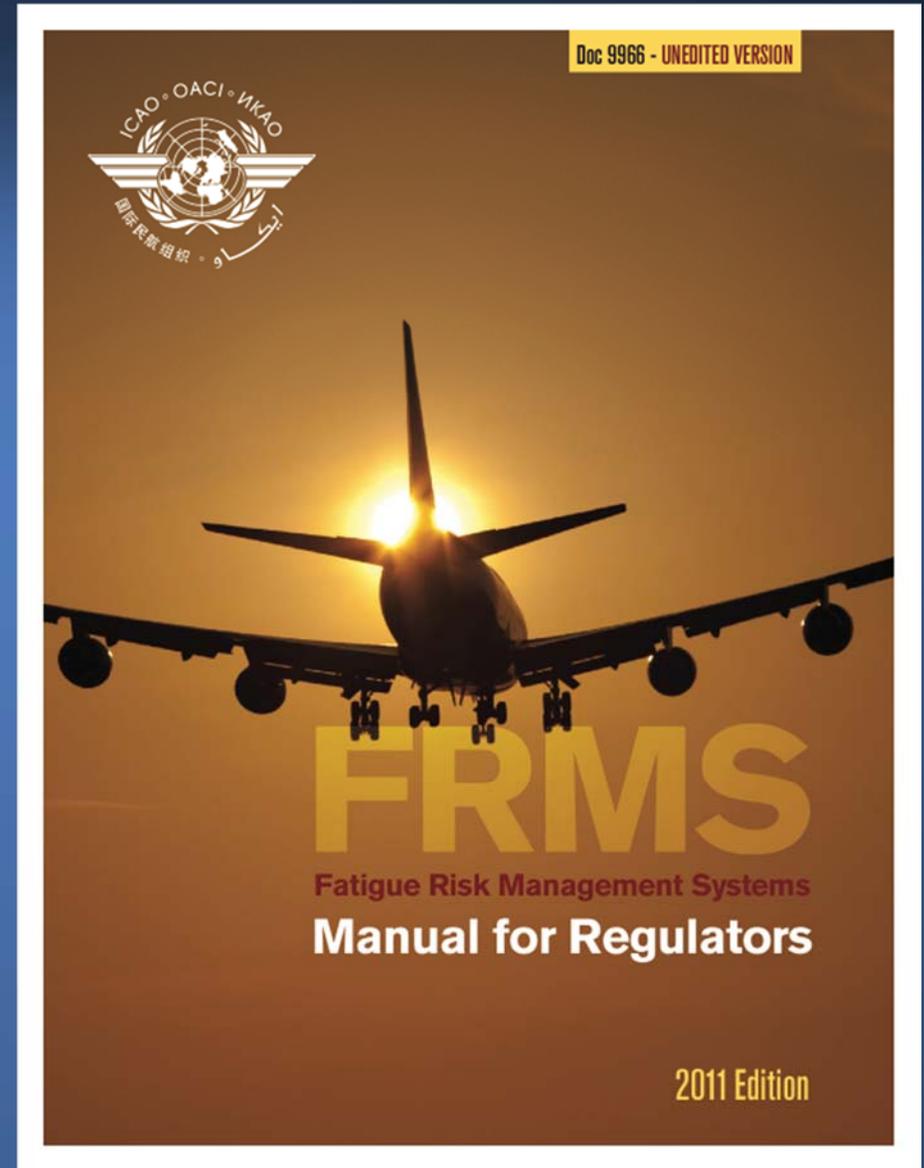
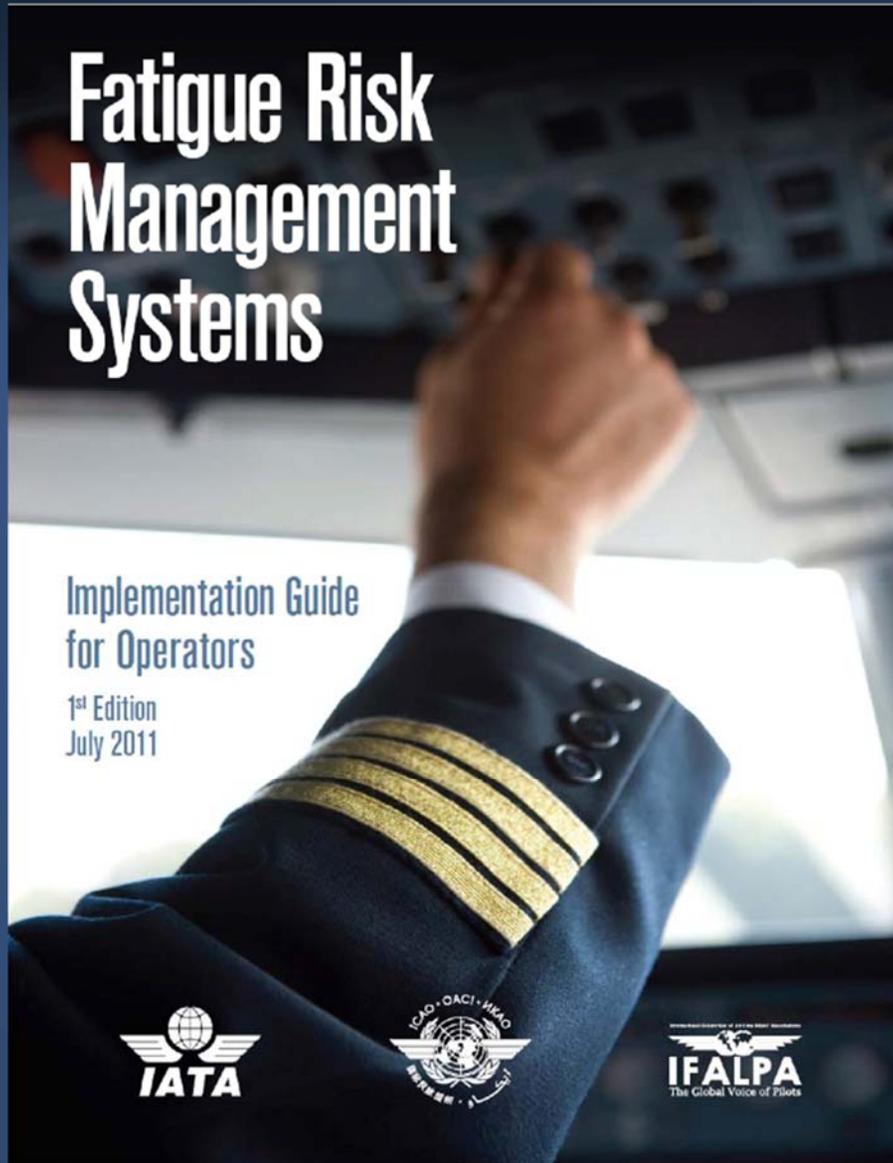


NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.



Examples



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Manage Fatigue = Enhance Safety

- Acknowledge risks
- Educate everyone
- Strong policies
- Take action/use strategies!
- Promote culture change



Good sleep, safe travels.



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